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**ABSTRACT**

A study was made of the importance to reading comprehension of using the author's top-level organization or textual schema. The subjects, 102 ninth graders with high, average, and low reading comprehension scores, read expository passages, some of which included signals explicitly stating the top-level organizational structure and some of which did not. The students wrote recall protocols immediately after reading the passages and again one week later. Analysis of the data revealed that fewer than 50% of the students made use of the author's textual schema in their reading; most students rated high in reading comprehension used the same schema for organizing their recall protocols as the author of the passage, while most students with low reading comprehension did not; use of this strategy was a better predictor of recall than test scores in vocabulary or comprehension; and students who used this strategy discriminated better between information consistent with the semantics of the passage and intruded information on the same topic than students who did not use the strategy. The use of signaling facilitated the performance of some students--especially low and average readers--on the immediate recall task but not on the delayed recall. (GN)

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Use of Author's Textual Schema: Key  
for Ninth Graders' Comprehension

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## Use of Author's Textual Schema: Key for Ninth Graders' Comprehension

Most of the knowledge acquired in schools is gained via written prose. Thus, one important goal of educators is to help students more efficiently acquire information from their reading. Reading programs at the upper elementary through high school levels stress the development of reading comprehension. Educators have long recognized that reading comprehension involves skill in following the organization of a passage (Carroll, 1972; Davis, 1941). Books and manuals encourage teachers to teach students to look for the author's organization in order to increase their retention (Dechant, 1970; McGuire & Bumpus, 1971; Robinson, 1975). These recommendations to teachers for identification and use of the author's organization in prose are based on common sense notions which may or may not prove valid. The validity of these recommendations needs to be investigated with a systematic, theoretically based procedure for identifying the author's organization of a passage and the organization used by the reader to learn and remember the passage.

Meyer's system (1975) for prose analysis, based on the theoretical developments in linguistics of Fillmore (1968) and Grimes (1975), is ideally suited to this task. With this system, the superordinate organizational pattern used by an author to organize his information appears at the top-level of the hierarchically arranged content structure resulting from the prose analysis procedure. The way in which the author organized the text is an integral part of Meyer's system in contrast to the procedures of Fredericksen (1975) and Crothers (1973) where the author's organization

is not reflected in the hierarchical nature of their resulting semantic networks.

Meyer's prose analysis system has been successfully used to objectively identify and classify different types of top-level organizational patterns of passages (Meyer, 1977; Meyer, Freedle, & Walker, Note 1). These top-level organizational patterns are equivalent to the major schemata used by an author to organize his text (Anderson, 1977; Rumelhart & Ortony, 1977) and to macro-structures of text (van Dijk & Kintsch, in press). An example of this top-level structure or textual schema in prose is one commonly found in scientific articles of an expository nature, a problem related to its solution, and classified as a response rhetorical predicate in the prose analysis system. This system can also be applied to a recall protocol written by a student after reading a passage; the protocol's top-level structure can be identified and compared to the top-level structure of the passage.

The present study uses this prose analysis technique to examine the importance to reading comprehension of the use of the author's top-level organization. In designing this study, it was posited that identification of the top-level structure or schema employed by the author to organize his content can be of great assistance to the reader in processing information from text. A model of reading comprehension (Rumelhart, 1977) based on schema theory explains reading comprehension as the process of choosing and verifying conceptual schemata to account for the text to be understood. While reading a passage, a reader can decide either to use the same type of schema employed by the author or provide another different type of schema for organizing the information for processing and storage in memory.

In most school situations and many learning situations outside of school, a person wants to know exactly what an author said. The reader needs to pick up as much of the information presented as possible as well as retaining the author's message or main ideas. For reading situations of this type, it seems reasonable that the most efficient strategy for a reader is to utilize the organization of the writer and store the information in the passage for memory in the same type of schema as that used by the writer. This strategy is posited to be more efficient because the reader does not have to search his memory for an alternative and appropriate schema nor does he have to reorganize the ideas in the passage to fit this different schema while reading; instead, he saves processing time by utilizing the same schema as that of the author and organizing the information in the same way as the author.

Of course, there are times when using schema of the same type as the author is not efficient. One such time would be when the reader's purpose is simply scanning an article for a specific detail. Another time would be when the reader disagrees with the schema of the author (Meyer, Freedle, & Walker, Note 1). In addition, on occasions a reader must integrate information by a number of authors on one topic. The first reading of the articles would probably be most efficient with the proposed strategy of utilizing the same type of schema as that of the author, but later integration and comparison would require restructuring with different schemata provided by the reader.

Although there are certain situations when using the same schema as that used by the author would not be desirable, it would appear to be the most efficient strategy for most school learning situations. Thus, it

seems to be important for students to utilize a strategy for identifying the top-level rhetorical predicates or author's textual schema found in prose. The present study examines whether there is a differential in the use of this strategy related to the reading comprehension level of ninth-grade students as gauged by standardized test performance and teacher appraisal. It also looks at the relationship between use of the author's top-level structure and the amount of information that can be recalled from a passage. In addition, an examination is made into whether or not signals provided by an author explicitly stating the top-level rhetorical structure of a passage facilitate recall and the use of the author's organization.

Signaling is a non-content aspect of prose which gives emphasis to certain aspects of the semantic content or points out aspects of the structure of the content (Meyer, 1975). One type of signaling explicitly informs the reader of the top-level structure of the passage. For example, in a passage organized with a response rhetorical predicate, the author could highlight this top-level structure with signaling by the explicit use of the labels problem and solution. With Cornell University students, signaling effects were minimal (Marshall, 1976; Meyer, 1975), while they facilitated learning for junior college students (Marshall, 1976). In the present study, signaling was expected to assist students in identifying and using the author's organization in processing the passages. It was expected to help students not normally utilizing this strategy more than those who normally employ it. A group of ninth graders with average vocabulary skills but poor reading comprehension was identified to see if they were deficient in their use of this strategy and if signaling would facilitate their use of it and subsequent recall.

## Method

### Subjects

One hundred and two ninth graders attending Kino Junior High School in Mesa, Arizona, participated in the study. The students were divided into groups of high, average, and low comprehenders on the basis of their performance on the reading comprehension scale of the Stanford Achievement Test, a district reading achievement test, and evaluation by their English teacher. The mean percentile scores on comprehension from the Stanford Achievement Test were 77%, 54%, and 26% for the high, average, and low groups, respectively.

Signaling of the author's top-level structure was hypothesized to be particularly helpful for students with adequate word knowledge and word attack skills, but poorer reading comprehension. To examine the effects of signaling on this subgroup of ninth graders, 26 of the 102 students were identified whose stanine score on the reading comprehension test was at least one stanine below their stanine score of four or greater on the vocabulary scale of the Stanford Achievement Test. The mean percentile score on the comprehension scale for this group of underachievers in reading comprehension was 44.3, while their mean percentile score on the vocabulary scale was 60.1.

### Materials

Two well-organized passages of expository text with clearly identifiable top-level rhetorical predicates and appropriate reading levels for ninth graders were selected for the study. The top-level rhetorical predicate or textual schema for each passage was identified by analyzing the passage with the prose analysis procedure described by Meyer (1975). One

passage dealing with loss of body water was organized with an adversative rhetorical predicate, relating two contrasting viewpoints. This passage was selected due to previous data collected with it (Meyer, 1977) showing its top-level rhetorical structure to facilitate immediate recall and long-term retention over other discourse types presenting essentially the same facts about loss of body water. The second passage dealt with supertankers and was a modified version of an article with the same title appearing in Read magazine (1975), a magazine for reading and English at the junior high level. The supertanker passage was organized with a response rhetorical predicate; first the problem resulting from use of supertankers was described and then a three-fold solution to the problem was presented.

A with-signaling and without-signaling (Meyer, 1975) version of each passage was written. In the with-signaling version, the top-level rhetorical structure was explicitly stated and in the without-signaling version it was not. For example, the with-signaling version of the supertanker passage began with "A problem of vital concern is the prevention of oil spills from supertankers," while the without-signaling version did not include the words problem and solution and began with "Prevention is needed of oil spills from supertankers." In addition, in the with-signaling version, the three-fold solution was explicitly pointed out to the reader while it was not in the without-signaling version. There were 242 words in the with-signaling version including the title, "Supertankers," and 216 words in the without-signaling version which excluded the title. The same procedure was followed for the passage on the loss of body water; however, the adversative rhetorical structure required few words of signaling. The

with-signaling version differed from the without-signaling version primarily by its inclusion of the phrase, "In contrast to the action taken by coaches," and the title, "Views Class on Loss of Body Water." The with-signaling version contained 187 words, while the without-signaling version contained 169 words.

A recognition test consisted of sentences that were verbatim, paraphased, inferences, intruded information, or totally unrelated to the passages. The inference sentences represented inferences judged necessary to understand the passages. The intruded sentences were on the same topic as the information in the passage but were not discussed nor implied. The unrelated sentences served to see if the students were attending to the task and were on completely different topics.

#### Procedure

The students were stratified on comprehension level and sex, and then a stratified random assignment procedure was used to assign them to with- or without-signaling versions of the passages and order of presentation of the two passages. The study was conducted during the regular English period with students from all experimental conditions represented in each classroom. Each student received a booklet of two passages and lined pages for recall that had been assigned to the student through the random procedure prior to the experimental session.

Each student read one version of the body water passage and one version of the supertanker passage. After reading a passage, the student wrote down all s/he could recall from the passage using wording from the passage or his own words. One week later, the students were again asked to write down all they could remember from each passage. After recalling

each passage, each student then took the recognition test for each passage. Students were asked if they recognized the statements and to give a confidence rating on this task. Thus, a student could rate a sentence as "yes, certain (5)," "yes, think so (4)," "yes, guessing (3)," "no, guessing (2)," "no, think so (1)," or "no, certain (0)."

### Scoring

The recall protocols were scored using Meyer's (1975) scoring procedure. In addition to the total number of idea units recalled from the passage (total recall score), an index was given for the degree to which the student recalled the message or most central ideas of the passage. Idea units recalled corresponding to the top-level rhetorical predicates and related content at the top level of the content structure of the passages were credited two points and major idea units at the second and third level were credited one point; none of the other lower levels (seven levels for both passages) were credited. This score was called the message score. A weighted recall score consisted of the sum of a student's total recall score and message score.

The top-level structure of each protocol was analyzed to determine whether or not its top-level rhetorical structure was the same as that used by the author of the text. An example of the scoring system for the supertanker passage will be given to clarify the procedure. If the protocol was organized into two related clusters of ideas, one related to problems of supertankers and the other related to solutions for these problems, the protocol's content structure would be organized with a response rhetorical structure and classified as using the same organization as the author. For those protocols organized with the same structure as the author's,

seven to ten points could be assigned. Ten points were given if the previous requirements were met and the student used the words problem and solution in his protocol. Nine points were given if only solution was explicitly stated; eight points were earned if only problem was stated and seven points were given if the above requirements were met, but neither the word problem nor solution appeared. Five points were given for a protocol which stated explicitly or implicitly in one sentence that there was a problem and solution, but simply listed ideas from the passage without organizing the problems and solutions in related clusters. Three points were given if some other top-level structure was used besides that used by the author or a list-type structure; only four of the 408 protocols collected fit into this classification. Two points were given for a protocol where no explicit nor implicit mention was given to problems of supertankers or proposed solutions and the ideas were organized into a coherent list, an attribution top-level structure. One point was assigned to a protocol that implied no problems nor solutions and presented an incoherent listing of ideas from the passage with no apparent organization. Protocols scored with five to one points were classified as not using the author's organization. Reliability coefficients were .95, .97, and .98 among the three independent scorers for this measure on 18 randomly selected protocols.

## Results

### Use of the Author's Textual Schema

Chi square analyses were utilized in order to determine whether students classified as good comprehenders tend to organize their recall protocols with the same type of schema as that used by the writer of the text,

while students classified as poor comprehenders tend to use different types of schemata. The chi square analyses comparing the three comprehension groups' use of the same schema as the author for both passages can be seen in Table 1. The chi square values for these matrices for the immediate recall data as well as the similar looking matrices for delayed recall were all significant at at least the .001 level. Thus, a majority of high comprehenders use the same schema for organizing their protocols as the author of the passage, while most low comprehenders do not. The average group falls in the middle about half using the author's schema and about half using other schemata.

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Insert Table 1 about here

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Multiple regression and stepwise regression analyses were run to determine the best predictor of recall from the passages. The predictors entered into the equations were signaling, vocabulary scores on the Stanford Achievement Test, comprehension scores on the achievement test, sex, and use of the author's top-level structure. Use of the author's top-level structure was measured by the ten-point scale previously described. For all passages and all recall conditions, use of the author's top-level structure was the best predictor of total recall. For the supertanker passage on the immediate recall task, the correlation between recall and use of the author's top-level structure was .6 accounting for 36% of the variance in recall. The addition of vocabulary to the equation could predict an additional 11% of the variance; the other predictors could not contribute further to the prediction of recall. On the delayed recall

task for this passage, use of the author's structure in the delayed protocol predicted 56% of the variance with comprehension level as the next best predictor increasing the predictive power 3%. For the passage on loss of body water on the immediate recall test, use of the author's top-level structure predicted 52% of the variance in recall with vocabulary adding an additional 7%. For this passage a week later, use of the author's structure predicted 80% of the variance in recall and the next best predictor, comprehension, could add only 1%. Thus, the use of the author's textual schema appears to be a crucial skill for remembering information from text.

### Recall

Separate five-factor analyses of variance were conducted for each of the passages since they differed on structure type, content, amount of signaling, and number of idea units. The five factors were signaling, comprehension level, time of recall, sex, and order of passage presentation. For the three dependent variables of total recall, recall of the message, and weighted recall for both passages the main effects of comprehension level and time of recall were significant at the .0001 level, but neither the effects of signaling, sex, nor order were statistically significant. More specifically, for both passages and all dependent measures, the free recall data clearly supported the groupings of students into high, average, and low comprehension groups. For the supertanker passage, percentages of the total number of idea units recalled were 34%, 25%, and 15% summed over the two recall tasks for the high, average, and low readers, respectively ( $F_{2, 78} = 18.02$ ). Percentages for the message score for this passage were 51%, 38%, and 17% for the three comprehension groups ( $F_{2, 78} = 1098.73$ ).

Percentages recalled for the total recall score from the body water passage were 41%, 30%, and 17% ( $F_{2, 77} = 17.58$ ) and for the message score, they were 70%, 46%, and 27% ( $F_{2, 77} = 23.35$ ) for the high, average, and low groups of comprehenders, respectively. In addition, for both passages, significantly more information was recalled immediately from the passages than one week later (supertanker immediate total recall  $\bar{X} = 31\%$ , delay  $\bar{X} = 17\%$ ,  $F_{1, 78} = 198.09$ ; body water immediate  $\bar{X} = 39\%$ , delay  $\bar{X} = 18\%$ ,  $F_{1, 77} = 240.78$ ).

For the supertanker passage, there was a statistically significant Time x Signaling interaction which will be discussed in the next section of the paper. Other significant interactions were not consistent among dependent variables, passages, nor logically interpretable, and will not be discussed further.

### Signaling

Signaling had no effect on the body water passage which was organized with an adversative top-level structure. However, the supertanker passage contained a third more signaling; for this passage, use of the author's top-level structure and recall scores on the immediate recall task appear to be influenced by signaling. Both use of the author's structure as measured by the ten-point scale ( $F_{1, 78} = 5.6$ ,  $p < .02$ ) and total recall ( $F_{1, 78} = 7.05$ ,  $p < .01$ ) were greater for the with-signaling condition than the without-signaling condition on the immediate recall task, but the reverse situation occurred for the delayed recall task. The assistance of signaling on the immediate recall task and its hindrance for total recall on the delayed recall task are shown in Table 2.

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Insert Table 2 about here

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It is evident from Table 2 that the effect of signaling on the immediate recall task results from its facilitation effects on the low and particularly average comprehenders, not the students with high reading comprehension. The Signaling x Group x Time interaction was not statistically significant ( $F_{2, 78} = .99, p < .38$ ). This tendency for signaling to affect only low and average comprehenders can also be seen in the percentage of students from the with-signaling condition who used the author's textual schema. Of the 22 high comprehenders shown in Table 1 to use the author's textual schema about half (45%) were in the with-signaling condition; in contrast, 83% of the 18 average comprehenders and 67% of the 9 low comprehenders who used the same schema as the author read the passage in the with-signaling condition.

For the 26 students identified as underachievers in reading comprehension (comprehension scores at least one stanine below their vocabulary scores), the presence of signaling in the supertanker passage increased their recall on the immediate free recall task but not one week later. For total recall scores, the presence of signaling approached significant levels ( $F_{1, 24} = 2.37, p < .14$ ) and there was a significant Time x Signaling interaction ( $F_{1, 2} = 9.33, p < .005$ ). The mean total recall score for the with-signaling condition immediately after reading the passage was 48, while it was 33 for the without-signaling condition; on the delayed free recall task the mean recall for the with-signaling condition was 23 and it was 22 without-signaling. Increased use of the author's top-level structure with signaling was in the predicted direction, but not statistically significant (Time x Signaling interaction,  $F_{1, 24} = 2.03, p < .17$ ). For the passage on body water signaling had no effect ( $F_{1, 24} = .02, p < .89$ ).

In summary, an author's explicit statement of his top-level structure does not affect the retrieval strategy employed by ninth graders a week after reading a passage. Signaling does not affect good comprehenders who identify and use the author's structure regardless of signaling. However, there is some indication that greater amounts of signaling assist the learning and immediate retrieval of poorer comprehenders who normally do not use the author's structure, but these effects are not maintained over time.

### Recognition

On the basis of past research (Bransford & Franks, 1971; Frederiksen, 1975b; Kintsch, 1974) differences were not expected among the recognition scores of verbatim, paraphrased, and inference sentences one week after reading the passages; recognition scores on these sentences were expected to be higher than recognition scores for intruded and unrelated sentences. Only the latter predictions were supported by the data. For both passages, verbatim sentences were recognized better than any other type of sentences at at least the .001 level. There were consistent differences in the recognition of inference sentences by the comprehension groups on the two passages. High and average comprehenders were less confident in their recognition of inferences as sentences from the passages than low comprehenders ( $F_{2, 95} = 4.19, p < .02$ , supertanker passage;  $F_{2, 95} = 3.00, p < .05$ , body water passage). Thus, the data are more supportive of Hayes-Roth and Hayes-Roth (1977) who maintain that the studied wordings of passages are functional components of their memory representations.

There were no consistent differences among the comprehension groups on the verbatim or paraphrased sentences for the two passages. The only other

consistent finding for both passages related to whether or not the student used the author's top-level structure. Students using the author's structure were less likely to claim recognition of intruded sentences than students who did not use the author's structure for their delayed free recall protocol ( $F_{1, 95} = 9.33, p < .003$ , supertanker passage;  $F_{1, 95} = 4.05, p < .05$ , body water passage).

#### Discussion

Four important findings related to the use of the author's textual schema resulted from this study. First, less than 50% of the ninth graders sampled utilize this strategy in their reading. Second, most ninth graders rated by their teacher and standardized tests as high in reading comprehension use the same schema for organizing their recall protocols as the author of the passage, while most students with low reading comprehension do not. Third, students who employ this strategy of using the author's textual schema recall much more information from a passage than those who do not. Use of this strategy was a better predictor of recall than vocabulary test scores or comprehension test scores. Fourth, students who use this strategy can discriminate better between information consistent with the semantics of the passage and intruded information on the same topic than students who do not employ this strategy.

These findings support the view of reading as a conversation between a reader and an author (Grice, 1975). In order to communicate best with the author, the reader must be a good listener; that is, he must be able to interpret the passage with the same type of schemata as that used by the author. Thus, the reader must be familiar with the types of schemata used by authors and be able to select from his repertoire of schemata one

which matches the textual schema of a particular passage. Once he understands the author's message embodied in the text, he can employ other schemata to compare, contrast, and integrate it with other ideas. This view of reading is a more moderate position than that posed by recent investigators stressing the perspective of the reader and knowledge integration (Anderson, 1977; Spiro, 1977). Anderson (1977, p. 423) has stated that it is a naive view to believe that text contains meaning; instead, he stresses that meaning depends on the interpretation given to the text by the reader. The present study has shown that students who perform well in school in reading utilize the same textual schema as the author, and do, in fact, get more meaning from the text than students using their own different schemata. They can remember and retain to a far greater degree the message the author is trying to convey along with the supporting facts. Instead of being congratulated for employing different types of schemata to text in order to create meaning, poor comprehenders should be taught how author's frequently organize text and how to employ the strategy of identifying and utilizing the author's top-level structure in their reading.

Utilizing this strategy was much more effective for remembering information from the passage than using the common strategy of simply learning and recalling a series of attributes of a passage. The ability to identify and utilize the author's top-level structure in a passage appears to be a crucial skill in learning and remembering information from reading. The ability to employ this strategy may develop with age and schooling. Recent data collected with 39 graduate students reading and recalling the same passages showed that 100% employed this strategy. The

52 to 57% of the ninth graders who did not employ this strategy may consist of two groups related to Flavell's (1977) production-mediation deficiency hypothesis. Some may not have used the strategy because they are unaware of it. Others may have knowledge of the strategy but be unable to put it into production without assistance.

This latter group may represent the 26 underachievers in reading comprehension and the 19 average and low comprehenders who benefited from the author clearly and repeatedly signaling the top-level structure or schemata of the passage. The signaling may have provided them with enough assistance to produce this strategy for the immediate recall task; however, when this assistance was not available on the delayed task they could not produce on their own the strategy of using the author's structure for retrieval.

According to Rumelhart and Ortony (1977) schemata are used in both comprehension and retrieval from memory. Assuming that the use of the author's textual schema by a student can be measured from the schema used in his written recall, this study has clearly shown that using the same schemata in comprehension and retrieval increases a ninth grader's grasp of the message of a passage, his recall of information, and his ability to distinguish after a week between the substantive ideas presented and not presented in a passage. From the present study, it is unknown whether the poor comprehender fails to use the same schema as the author when processing the text, or fails in the match between the two at the retrieval stage, or both.

The students who benefited from signaling retrieved the information stored in memory with this strategy immediately after reading the passage

but not one week later. This finding is similar to developmental studies where students have been passively taught strategies (Bilsky & Evans, 1970; Moely, Olsen, Halwes, & Flavell, 1969) and the effects of the teaching were minimal beyond the short-term. Training to use the author's top-level structure needs to be much more involved for long-term effects than providing signaling in the text. Such training programs will have to involve explicit teaching, active participation, and examples of the usefulness of this strategy.

The present study has presented a methodology for studying this strategy and an indication of its importance for learning and memory. Further research is needed concerning the development, conditions for usefulness, and ways of training this strategy. The usefulness of this strategy requires investigation with different types of discourse, purposes, and time limitations. This line of research appears to have both practical applications for improving the teaching of reading comprehension and theoretical value in understanding strategy development and how people learn and remember discourse.

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Table 1  
 Use of Author's Textual Schema in the Immediate Free  
 Recall Protocols of High, Average, and Low  
 Ninth Graders on Reading Comprehension

| Comprehension Level<br>from Achievement Test | Passage           |                          |                    |                          |
|----------------------------------------------|-------------------|--------------------------|--------------------|--------------------------|
|                                              | Supertankers      |                          | Loss of Body Water |                          |
|                                              | Protocol Schema   |                          | Protocol Schema    |                          |
|                                              | Same as<br>Author | Different<br>from Author | Same as<br>Author  | Different<br>from Author |
| High                                         | 22                | 10                       | 25                 | 7                        |
| Average                                      | 18                | 17                       | 15                 | 20                       |
| Low                                          | 9                 | 26                       | 4                  | 31                       |

Table 2  
 Mean Difference in Total Recall Scores Between With-Signaling  
 and Without-Signaling Conditions for the Supertanker  
 Passage on the Immediate and Delayed Recall Test  
 for High, Average, and Low Comprehenders

| Comprehension Groups | Mean Signaling Difference<br>(With-Signaling-Without-Signaling) |                |
|----------------------|-----------------------------------------------------------------|----------------|
|                      | Immediate Recall                                                | Delayed Recall |
| High                 | -3.06                                                           | -5.63          |
| Average              | 10.48                                                           | - .73          |
| Low                  | 6.55                                                            | -2.95          |